ESD-TR-67-406

MTR-505

OPERATIONAL REQUIREMENTS FOR A BASE DISTRIBUTION SYSTEM

FEBRUARY 1968

K. H. Schaeffer

Prepared for

DEPUTY FOR COMMAND SYSTEMS
AIR FORCE COMMAND AND MANAGEMENT SYSTEMS DIVISION

ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
L. G. Hanscom Field, Bedford, Massachusetts

Project 512X
Prepared by
THE MITRE CORPORATION
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FOREWORD

This technical documentary report was prepared in September 1967 for the Air Force Command and Management Systems Division, Deputy for Command Systems, by The MITRE Corporation under Project 512 (Contract Number AF19(628)-5165). The original intent of this study was to analyze message and mail distribution within the command and control environment; however, an early review of various proposals for improving message and mail distribution on AF bases led the study participants to the conclusion that the various elements of base distribution are deeply inter-related, and that a meaningful proposal for improvement must include consideration of all elements and the significant relationships between them. In view thereof, the scope of this study was increased to include the entire base distribution system.

For ease of conversion, the results of this study have been documented in the format of a "Required Operational Capability-ROC" as defined in attachment No. 1 to AFR 57-1; MTR-505 is the secondary document control number assigned by The MITRE Corporation.

REVIEW AND APPROVAL

This technical report has been reviewed and is approved.

William F. Heisler

WILLIAM F. HEISLER, Col, USAF
Chief, AF Cmd & Mgmt Sys Div
Deputy for Command Systems

ABSTRACT

This report outlines the deficiencies of the present message and mail distribution systems at Air Force bases and proposes a required operational capability for these systems. The preliminary determination of the deficiency and the required operational capability includes a description of the present systems, traffic data from nine Air Force bases, an analysis of special messenger service and a simple base distribution model. Solutions mentioned to achieve the required operational capability are Automatic Message and Mail Sorting Systems (AMMSS) in addition to AFCS's Automatic Base Communication Systems (ABCS). A Category C - Mission Analysis is recommended as a first step to achieve the suggested operational capability. The report follows the outline of a "Required Operational Capability ROC" (AFR 57-1).

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SECTION I

INTRODUCTION

During the past year MITRE studied the Base Distribution System at Hanscom and visited eight other Air Force bases for familiarization and data collection.* Simultaneously, a review was made of various proposals for improving message distribution on Air Force bases. These efforts led to the conclusion that the various elements of base distribution are so deeply affected by each other that meaningful proposals for base distribution must include consideration of all elements and the significant relationships between them. This Technical Report outlines the deficiencies of the present base distribution systems, proposes an operational capability for base distribution systems, makes a preliminary determination of the deficiencies and the required operational capability and proposes an Automatic Mail and Message Sorting System (AMMSS) in addition to AFCS's Automatic Base Communications System (ABCS) as possible solutions to achieve the required operational capability. As a first step in achieving the suggested operational capability, a Category C-Mission Analysis is proposed. The Technical Report follows the format of a "Required Operational Capability ROC" as defined in Attachment 1 to AF Regulation 57-1.

*The Air Force bases visited were Andrews, Bolling, Kelly, Lackland, Mather, McClellan, McGuire, and Randolph.

SECTION II

DEFICIENCIES/NEEDS

The successful and efficient management of Air Force operations and resources requires the expeditious flow of data and information within as well as between Air Force bases. Yet base distribution of messages, memoranda, letters, reports and data records is slow, cumbersome, and inefficient.

Travel time for messages between bases is measured in minutes, but hours are required for messages to reach the communications center and for distribution at the destination base. The time required for mail to travel between base postal facilities is often equal to the time required to distribute the mail on base. Intra-base mail handled through official base distribution channels routinely requires one to two working days to reach its destination.

During the past decade, major advances have been made to expedite the speed and reliability of data and information flow between Air Force bases (AUTODIN, AUTOVON, AUTOSECVOCOM, and improved (jet-powered, zip coded) air mail service). Even more startling improvements have been made in data and information processing through the introduction of automatic data processing equipments and software (Base Level Controller System, AFICCS, etc.) and through improvements in the message and correspondence generation process (the revisions of AFM 10-1, "Preparation of Written Communications," and AFM 10-2, "Management, Use and Preparation of Air Force Messages"). However, little, if anything, has been done to expedite the flow of paperwork between action offices, communication centers and mail facilities within Air Force installations. This system essentially is still the same manual processing and distribution system it has been since the Air Force was established.

To a large extent the slowness of base distribution is attributable to the fact that traffic must be processed (sorted, and if classified, accounted) and transported repeatedly before it reaches its ultimate destination. Most incoming traffic requires three or more sorting and transportation cycles before it is delivered to the action addressee. Since these functions are performed on a batch basis, traffic spends most of its time awaiting either processing or pick up.

When this slow distribution process becomes utterly intolerable, personnel handcarry documents between offices and to and from the mail and message distribution centers. Thus, the cost of base distribution is not only the cost incurred by the official base and unit administrative services but also the hidden costs of handcarrying documents as well as the additional hidden management costs incurred when information is not available when needed or when action cannot be taken until the information buried in the distribution channels becomes available.

AFCS estimates that within the next five years the volume of record data (teletype or card) will probably more than double.* There is no reason to believe that mail and intra-base traffic will not increase at the same rate.** Today's base distribution is the weak link in the Air Force data and information flow, and as such tends to neutralize and even negate some of the advances made in data and information flow in other areas. Therefore, to make the entire Air Force data and information flow equally responsive to the Air Force's mission requirements, a modern advanced base distribution system is required.

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*AFCS ROC-3-66: Automatic Base Communications System

**During the past two years, deliveries by base distribution at McClellan increased by 85%.

SECTION III

REQUIRED OPERATIONAL CAPABILITY

The requirement is for an upgrading of message and mail distribution at USAF installations. The system must encompass the entire process of collecting traffic of various precedent and security levels from all the writers, originators, and releasers of messages, mail, memoranda, letters, reports, and data records, as well as from the inter-base communication facilities and the U. S. Post Office; processing (sorting, switching, and if necessary, accounting) this traffic, and delivering it to the individual on-base action addressees, the inter-base communication facilities and the U. S. Post Office. The system must provide a) each individual action office with faster and more reliable distribution of mail and messages, so that the speed of on-base collection and distribution is commensurate with the speed of inter-base traffic and Air Force command and management requirements, b) deliver incoming communications (unopened) direct to action offices in accordance with the requirements of AFM 10-1A, paragraph 1-3(b).

SECTION IV

PRELIMINARY DETERMINATION OF DEFICIENCIES/NEEDS AND THE REQUIRED OPERATIONAL CAPABILITY

The subsequent statements about the organization and structure of the present base distribution systems and their traffic loads are based upon a survey conducted at Hanscom Field in December 1966 and January 1967 and on visits to Andrews, Bolling, Kelly, Lackland, Mather, McClellan, McGuire, and Randolph Air Force bases during July and August 1967.

GENERAL STRUCTURE

Every Air Force base operates a mail and message base distribution system in general accordance with AFM 10-1, AFM 10-2, and AFR 182-15. The general structure of these base distribution systems is shown in Figure 1.

UNCLASSIFIED ROUTINE TRAFFIC

Base distribution generally consists of a mail and message distribution center which collects narrative and card messages* from the communications center and official mail** from the U.S. Post Office. The distribution center sorts the incoming non-accountable (unclassified) mail and unclassified routine messages by the mail stops to which the distribution center makes delivery. There is usually one mail stop for each building or directorate of the base unit and one mail stop for each tenant organization. At these mail stops, intra-base mail, outgoing mail and messages are also picked up which, after sorting either en route or at the distribution center, are delivered to the communications center, the U. S. Mail or one of the other stops respectively.

The number of mail stops at a base can vary widely. At the bases visited they varied between 29 (Bolling) and 376 (McClellan). Base distribution service, on the average, each mail stop twice

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*Magnetic tapes are usually picked up by the addressee at the communications center thus bypassing the base distribution system.

**Personal mail is delivered from the Post Office to the CMR (Consolidated Mail Room) or the Unit Mail Rooms and distributed by them in accordance with AFR 182-11. It is the Post Office's responsibility to sort the mail into official and personal mail. Base distribution is not involved in the handling of personal mail except possibly for trucking the bags of personal mail between the Post Office and the mail rooms. The handling of personal mail is not considered in this report.

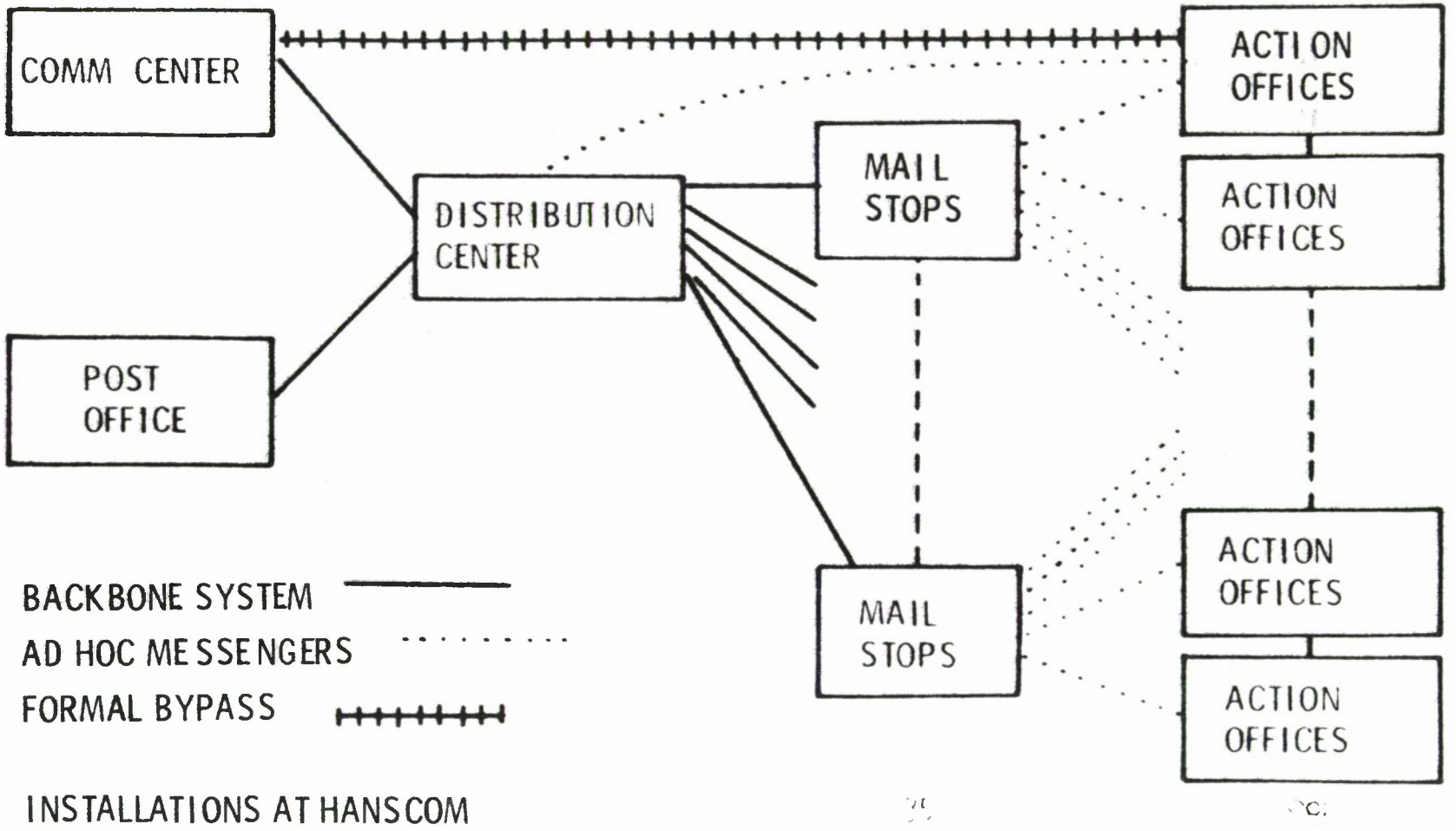


Figure 1. Today's Base Distribution

daily. A few stops on each base receiving and generating a great amount of traffic are served three or four and even five times daily; minor stops are served once.

Each base has a far greater number of action offices than mail stops. On the basis of the organizational listings in the base telephone book, rough estimates were made of the number of action offices at each base. These estimates varied between 880 (Hanscom) and 3000 (Andrews). See Figure 2. To service these individual action offices, further distribution must be made from the mail stops served by the base distribution center. This distribution is accomplished by the agencies or organizations served. Not all action offices pick up their incoming mail and messages separately at the mail stops. Usually an administrative section representing a number of action offices sends a messenger to the stop (quite often a mail room) to deliver outgoing and pick up incoming messages and mail. In turn this messenger must sort the incoming material by action offices for delivery, or for pick-up by the individual action offices. The secondary distribution centers can be as large as the base distribution centers. For instance at Kelly AFB the pick-up and delivery section of base distribution is authorized 13 slots while the distribution section of the Directorate of Material Management has 19 slots even though this group delivers only to branch not section level.

CLASSIFIED ROUTINE TRAFFIC

Classified routine messages and accountable (i.e., registered and certified) mail are distributed as just described. The differences are that these items are logged, accounted, and receipted at the distribution center, at the mail stops and in the subsequent routing to the action offices. Some bases carry classified mail and messages on all distribution runs, other bases make special runs for the classified material. The latter bases are those whose classified material forms a relative small part of the total items handled.

PRECEDENT TRAFFIC

Special procedures are in effect for the distribution of message and card traffic of priority and higher precedent. For incoming traffic of this type the communications center usually notifies the distribution center by means of a buzzer or similar device of the existence of this traffic. The distribution center collects this traffic from the communications center immediately and calls the addressee for instructions. The addressee's instructions tend to be one of three types:

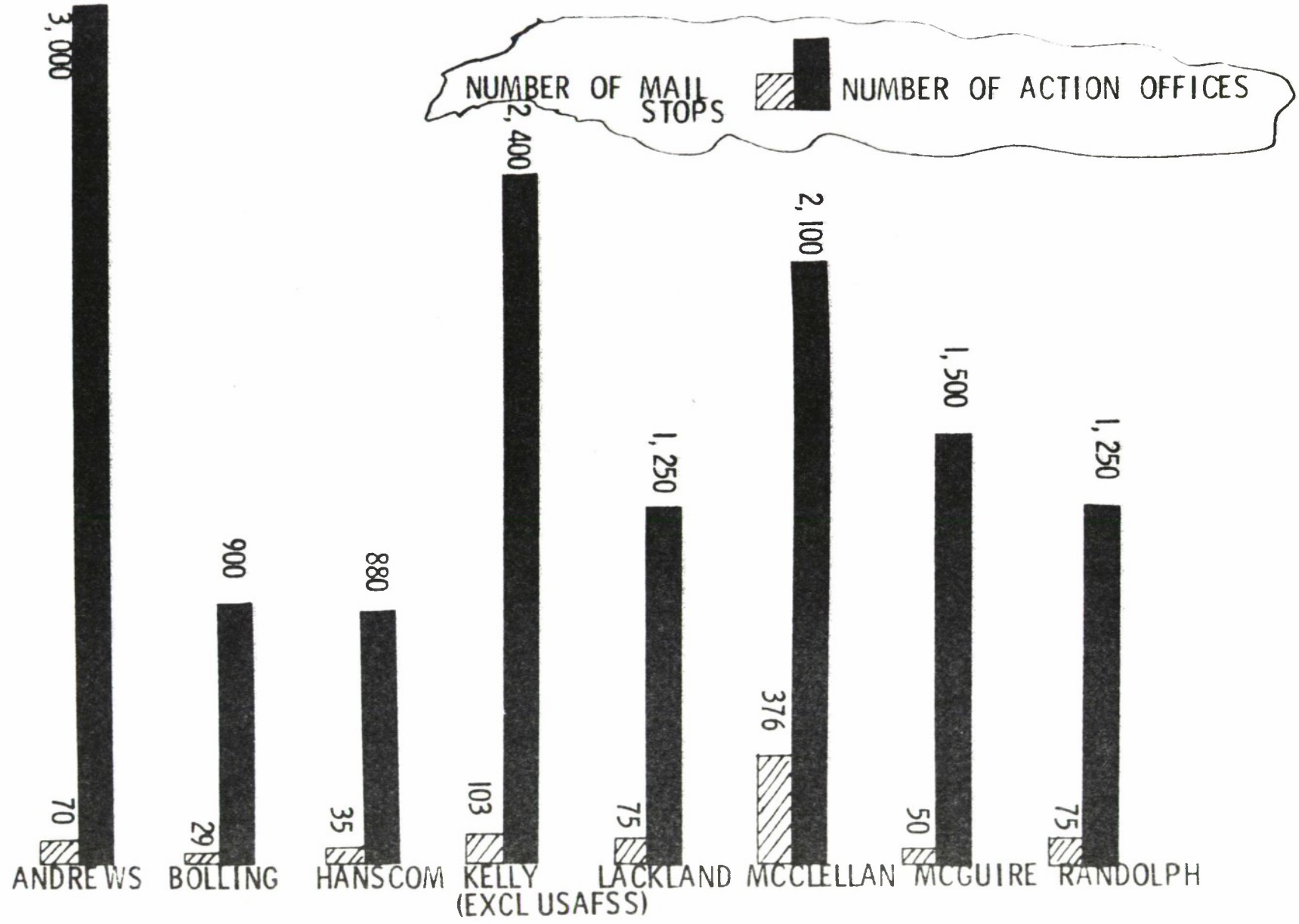


Figure 2. Number of Mail Stops and Action Offices at Air Force Bases

(a) to read the message over the phone and place the hard copy in normal distribution channels (this procedure can apply to unclassified messages only);

(b) to hold the message for pick-up by addressee, or, his designated representative;

(c) to place the message in normal distribution channels.

The procedure for flash messages usually calls for handcarrying of the message by the communications clerks to the distribution center and by the latter to the addressee.

Some bases have pony circuits or small computerized distribution systems for narrative message and card traffic to selected base facilities. The AFCS ROC (AFCS-3-66) essentially proposes to improve and extend this type of distributive capability through an automatic base communications system.

Outgoing message traffic of priority precedence or higher is handcarried by the originating (or releasing) office to the base distribution center, this office in turn forwards the messages to the communication center. Releasing offices cannot take their messages directly to the communication center since according to AFM 10-2 (paragraph 9) the message distribution center receives and distributes all incoming and outgoing messages and performs certain administrative controls on each incoming and outgoing message. While AFM 10-2 (paragraph 9) specifically requires central administrative review of all message traffic, AFM 10-1 (paragraph 1-3) equally specifically prohibits such a review of written communications.

VARIATIONS BETWEEN AIR FORCE BASES

The primary variation in the base distribution systems among Air Force bases is due to the number and size of tenant organizations on the base. Large tenant organizations like the Hq AFSC at Andrews, 21st Air Division (ADC) at McGuire, Hq USAF Military Personnel Center at Randolph, or the Hq USAF Security Service at Kelly have their own mail and message distribution centers. These centers pick up and deliver their own mail and messages from the Post Office and communications center. Some of these tenants also have their own U. S. postal station as for instance Hq AFSC and Hq USAFSS (the latter also has its own communication center). This procedure requires that the U. S. Postal Service make a breakout of the mails by the organizations which pick up their mail directly. This speeds up the delivery of the mail since the Post Office on the base will begin working the incoming mail during off-duty hours (anywhere from

4:00 a.m. on), whereas base distribution works only during normal duty hours. Still all tenants are served by base distribution to receive intra-base communications and redirected mail. The latter are either mis-sorts by the Post Office, consolidated mail (see next paragraph), or incompletely addressed mail which had to be opened by the base distribution center to determine the addressee.

Air bases differ also widely in the amount of processing they perform on outgoing mail. Some bases sort outgoing mail only by local, out-of-town and airmail, others consolidate all the mail addressed to certain air bases (anywhere from one to over 50) in mail pouches, large envelopes or bundles. This procedure expedites the mail handling for the Post Office but mail pouches and large envelopes tend to slow up the delivery at the receiving air base, since this mail cannot be worked by the Post Office but must be worked by the base distribution center.

BASE DISTRIBUTION TRAFFIC ESTIMATES

During the visits to the different air bases, an attempt was made to obtain statistics on the volume of traffic handled by base distribution. Many bases do not keep records of this type. Others which keep records often vary their definition of what an item is from one count to the next. For instance, there is a tendency to count outgoing pouches as one item, incoming pouches by the items they contain. In message counting, base communications counts every outgoing message addressed to more than one base as one message. In counting incoming messages, each message arriving at a base is counted as one message, thus the multi-based address message is now counted as many times as it has addressees. As a result of this counting scheme, nearly every base communications center receives more messages than it sends. If base distribution counts incoming messages, they tend to count each copy of the message which they distribute to a different office symbol. On the whole, message and accountable mail counts are accurate since these items are logged. Unclassified mail counts which are performed once a month or quarter are probably not very accurate. There is no incentive for accurate counts, and the figures are not audited. Slot authorizations are based on time required to sort, number of stops on delivery runs, etc., rather than on mail and messages processed.

Table I contains the traffic estimates which were obtained from base distribution at the various Air Force bases. Since the bases of the mail counts are not consistant, comparable estimates were derived for seven bases. See Figure 3. The blanks indicate that no estimates were available. A few conclusions are apparent from these data. Traffic is not uniform from one base to the next, nor, can it be estimated simply by number of military personnel

TABLE I

MONTHLY MESSAGE AND MAIL TRAFFIC ESTIMATES

Air Force Base	Major Activities	Month	Incoming Messages: Total	% Classified	% High Precedent	% Routine	Outgoing Messages: Total	% Classified	% High Precedent	% Routine	Incoming Mail: Total	% Accountable	Outgoing Mail: Total	% Accountable	Intra-Base Mail
Andrews	Hq Command, USAF Hq AFSC										150,000[1]	1.5%			
Bolling	Hq Command, USAF	7/67	5,500				2,300								
Hanscom	ESD AFCRL	11/66	6,938				3,936	17%			129,142	6%	91,407	6%	
Kelly	SAAMA*	7/67	38,606	3.5%	1%	71%	23,200		4%	65%	418,632	.8%	578,998	.5%	174,360[5]
Lackland	Lackland Military Trg Center	7/67	3,700				2,215		<1%	70%	65,000		30,000		
Mather	3535 Nav Trg Wg (ATC) 320 Bomb Wg (SAC)	7/67	6,172		30%	40%	4,116		30%	40%	22,000[2]	1.5%[3]	8,000[2]	2%[3]	
McClellan	SMAMA	7/67	24,143				7,539				89,132[4]	2.1%	83,004[4]	.3%	483,500
McGuire	21st AF (MAC) 21st AD (ADC) 438 MAW										140,000	2%	100,000	2.5%	
Randolph	Hq Air Training Command USAF Military Personnel Center	7/67	38,587				10,720		1%	90%	930,374	.6%	616,489	.9%	

*The Kelly data does not include USAFSS which has its own Comm Squadron and U. S. Postal Station.

[1]Estimate includes personal mail

[2]Does not include 320 HBW

[3]Includes 320 HBW

[4]On the basis of spotchecks, these counts are too low for item counts. Incoming counts are apparently items in pouches and incomplete addressed mail. Outbound are apparently pouched items. Post Office eatimates 1.4 to 1.5 million pieces per month (in plus out) where pouches are counted as one piece.

[5]No basis for this estimate could be obtained. By visual inspection the ratio of intrabase/interbase mail appears to be questionable. The amount of incoming/outgoing mail appeared to correspond to the activity in the base distribution center.

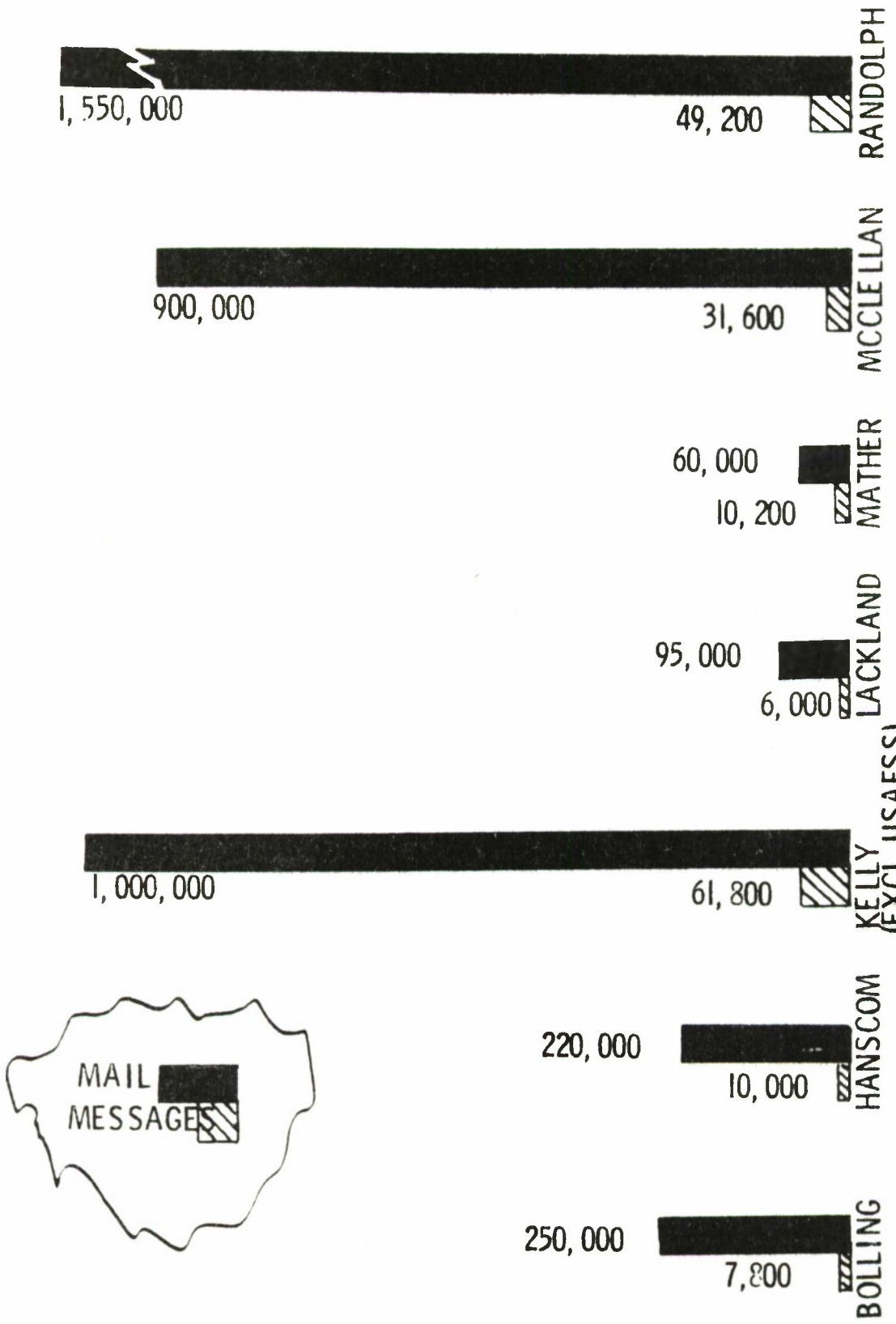


Figure 3. Monthly Mail and Message Traffic (Derived Estimates)

assigned. The units which appear to handle the smallest amount of traffic are the training units, followed by operational units. However, while the latter's mail traffic is very light, these units are the ones that have the highest proportion of high precedent traffic. The logistic and administrative units are the units which handle the largest amount of both mail and message traffic; however, the latter is almost exclusively of "routine" and "priority" precedence. Percentage-wise, the heaviest volume of classified mail traffic appears to be handled by the units of the Systems Command.

Figure 4 represents a first consolidation of the traffic composition estimates. The chart indicates that the ratio of high precedent to other messages is about 1:10; this estimate is based on AUTODIN traffic statistics for February 1967. The mail counts obtained are rough estimates, hence it is difficult to determine the mail to message ratio. From the more reliable data in Table I, a ratio of about 1:25 can be derived. This ratio rises at Randolph AFB which appeared to have the best overall statistics to 1:36 for incoming traffic and 1:58 for outgoing traffic, even though Randolph underestimates its mail count by counting many of its pouches as one piece of mail. Estimates for the ratio of inter-base mail to intra-base mail are even harder to find. During the visits, spot checks were made of the mail on the distribution trucks of several of the bases. These checks invariably resulted in higher ratios that the 1:4 which the chart indicates. The official data obtained from Kelly AFB does not confirm this high ratio. However, visual inspection and rough estimates from the supervisor of the distribution trucks did confirm a 1:3 to 1:4 ratio. No attempt was made to estimate the intra-base mail which never reaches the distribution center. That this mail -- which is probably mostly handcarried -- can reach considerable proportions was indicated by the supervisor of the mailroom of the Directorate of Material Management at Kelly AFB who estimated that at least 75% of the communications handled by his section never leaves the Directorate. This figure appears to be unusually high, a similar guess by the NCOIC of the mailroom at the Military Personnel Center at Randolph AFB was 20%.

ANALYSIS

Special Messenger Service

The shown deficiency of the present base distribution system for Air Force operations expresses itself in part through the use of special messengers which handcarry communications from one action office to another. Since these special messengers operate on an ad hoc basis, no records are available which show the effort expended on these activities. However, frequently such special messengers -- usually an airman or clerk -- will utilize the motor pool's taxi

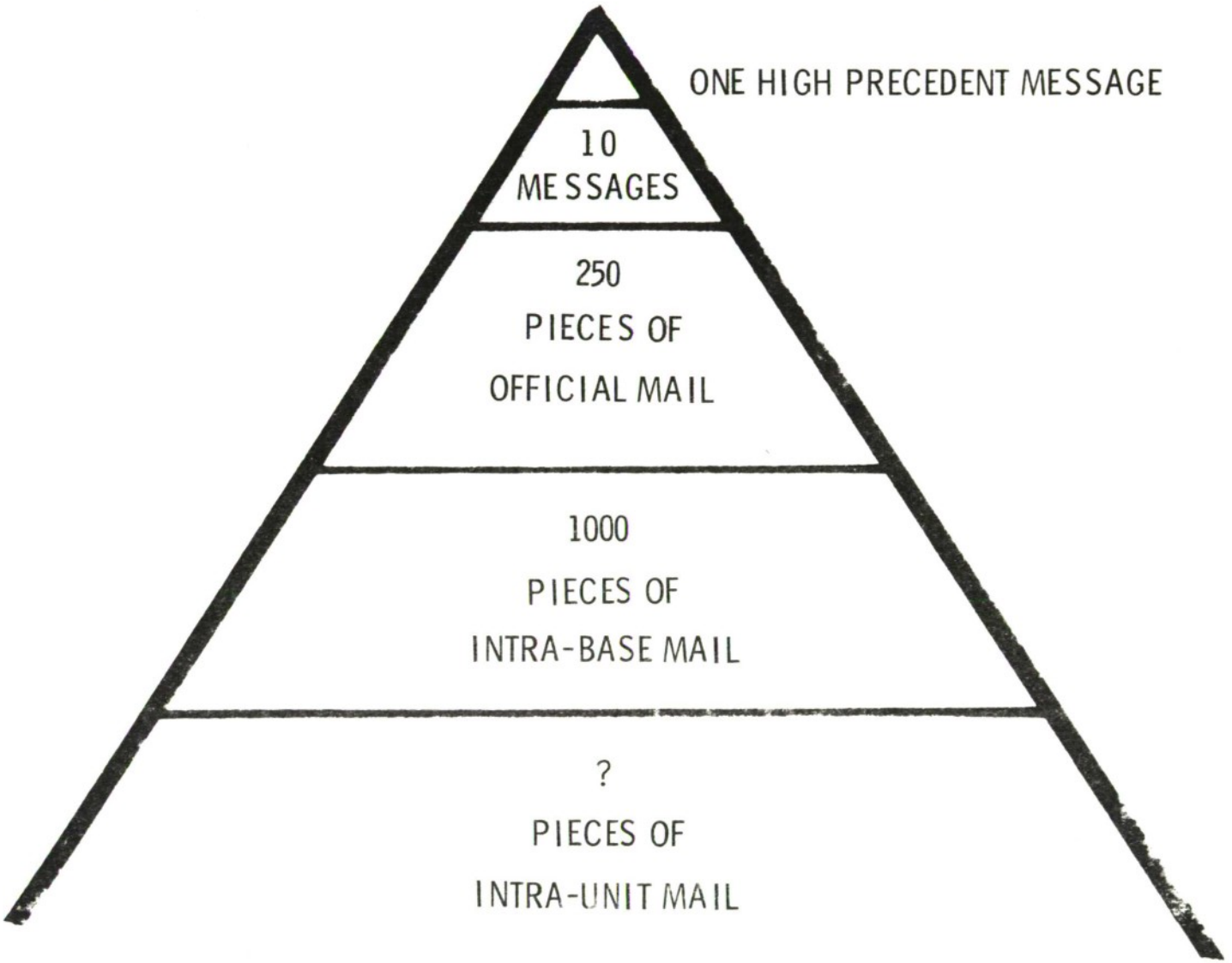


Figure 4. Traffic Composition

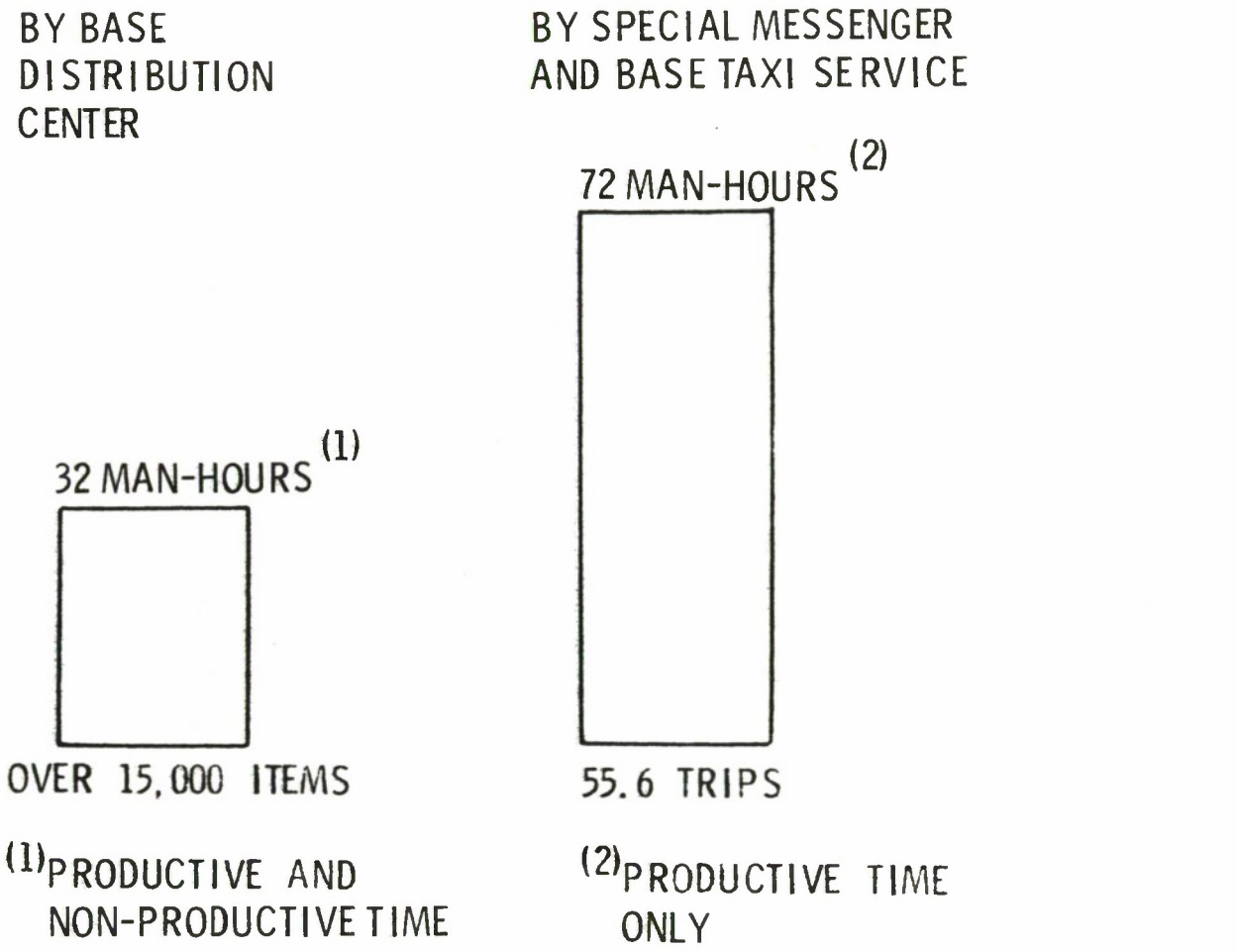
service to carry communications from the action office in one building to the action office in another. At all bases where inquiries at the motor pool were made, the NCOIC acknowledged that substantial efforts were expended by the motor pool in shuttling messengers between buildings. Data on these activities were available only at one base -- Lackland. Here a survey conducted in August-September 1964 showed that during a two-week period a daily average of 55 on-base trips were made for the purpose of carrying messengers between buildings. The length of these trips ranged from 10 to 120 minutes with an average of nearly 40 minutes. All these trips were during normal duty hours. Each trip requires one driver from the motor pool and a messenger from the organization requesting the service. Figure 5 shows the manpower effort expended on this special messenger service and base distribution's effort (four airmen) for delivering each duty day an average of over 15,000 items of mail and messages between the mail stops, the base distribution center, the communication center, and the Post Office.

Figure 3-6 shows all the trips during the two-week survey by the hour of the duty day during which the special messenger trip started. This data presentation yields a bi-modal distribution with a peak early in the morning and after lunch. The lull over the noon hour suggests that most of these special messenger trips were not on an "immediate" basis but could be performed by a common-user base distribution system if action office to action office service was provided within two to four hours.

A Simple Base Distribution Model

Today, distribution at bases is organized hierarchically. Incoming mail and messages are sorted usually at least three times between the Post Office or communications center and the addressee. Outgoing mail and messages are consolidated the same number of times before they reach the Post Office or communications center. Precedent traffic can avoid this repeated sorting and collecting but only at the expense of special messengers which carry this traffic to the base distribution center.

Figure 7 is a schematic of a three-sorting-level distribution system (one level fewer than for many action offices) where each stop is served three times daily (which is more frequent than the two services a day which most stops receive today). The schematic assumes that each run begins only after the previous run has been completed and all intra-base mail has been sorted. This assumption is valid for practically all schedules examined during the survey and the visits. This chart also shows the flow of on-base mail from one action office to another if the action offices belong to different base mail stops, i.e., are in different directorates or in different buildings. The chart assumes that the base distribution



SOURCE: LACKLAND AFB SURVEY 24 AUGUST TO 4 SEPTEMBER 1964

Figure 5. Man-Hour Expenditure for Base Distribution Services

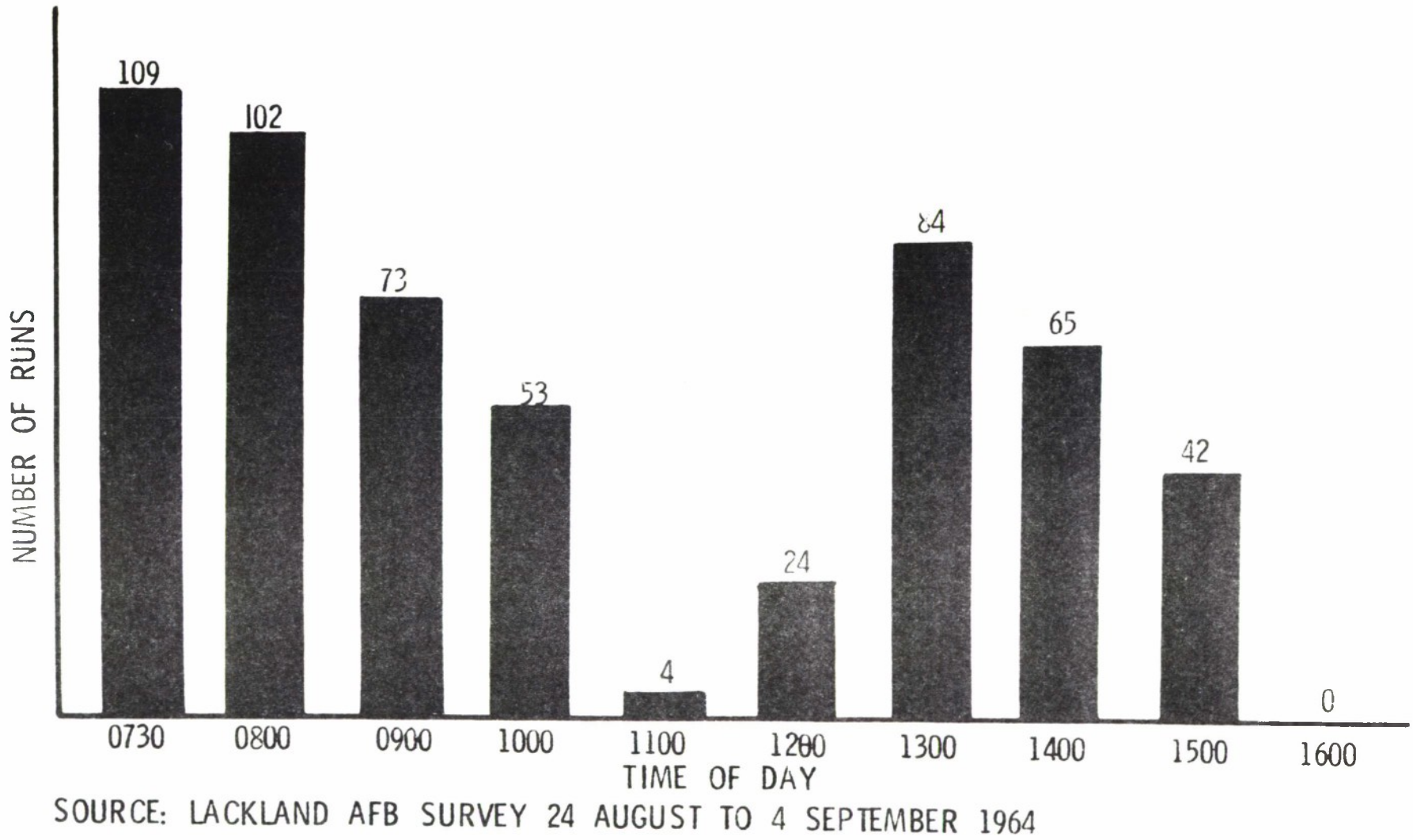


Figure 6. Special Distribution Runs by Time Run Began

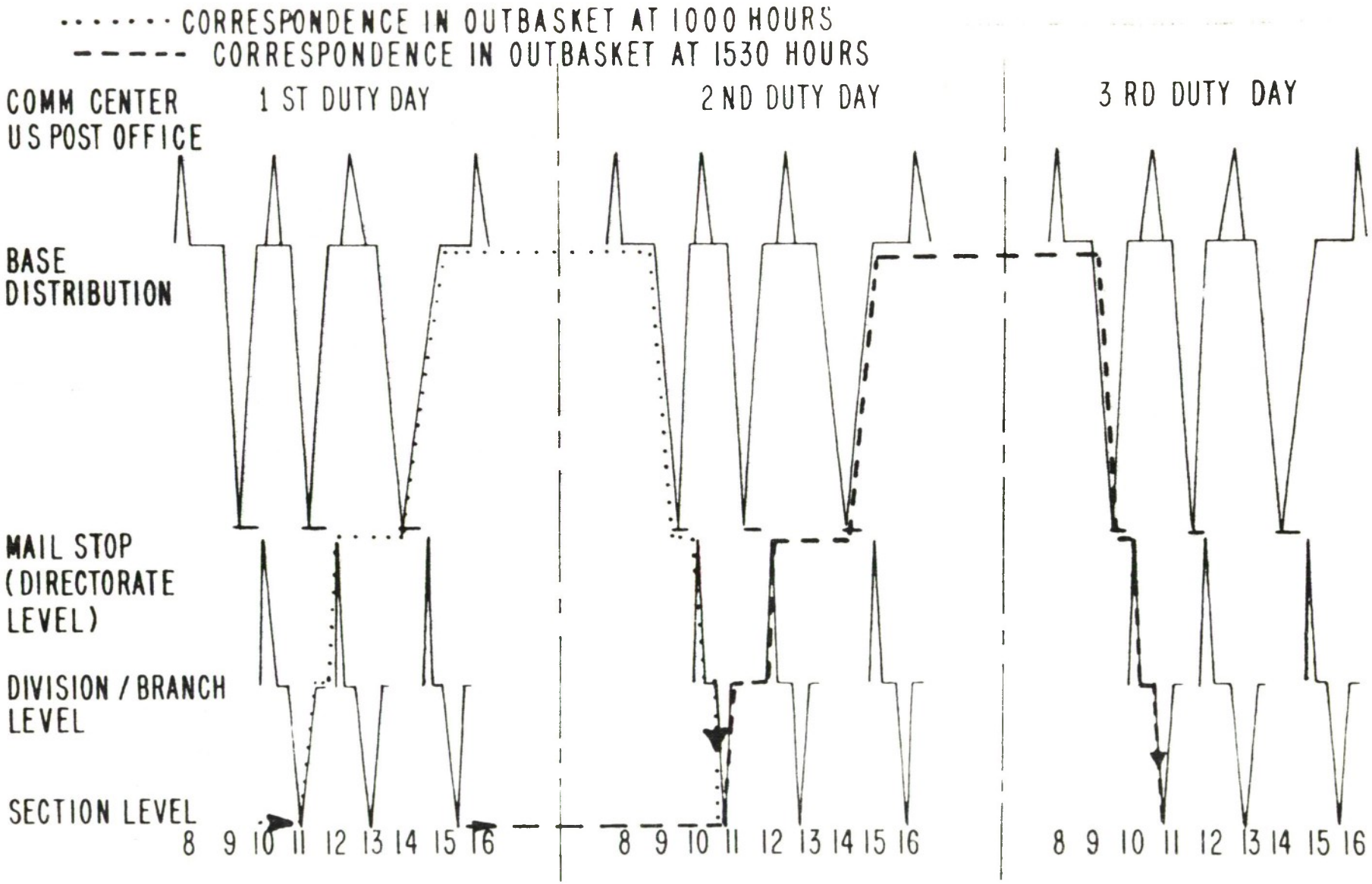


Figure 7. Flow of Intra-Base Correspondence -- 3 Sorting Levels-3 Runs Per Day

truck cannot pick up and deliver communications on the same run. Therefore, this schematic does not include the en route sorting capability of a mobile distribution truck. However, it should be noted that the truck can pick up and deliver communications on the same run only if the sending mail stop is an earlier stop on the route than the receiving mail stop. In two-way correspondence between two action offices this is at best true in one direction. Still en route sorting is an important capability since it reduces the mail handling which has to be performed between successive runs -- thus allows for longer routes or more runs per day. .

From the schematic (Figure 6) it is apparent that intra-base correspondence between action offices served by different mail stops requires one complete normal duty day. To this time must be added half the time between service (one-sixth of the normal duty day if there are three pick-ups and deliveries per day) which is the average time an item spends in the outbasket before it is picked up. As Figure 7 indicates, an item ready for pick-up at 1000 hours of the first duty day will be delivered at 1100 hours on the second duty day, but an item ready for pick-up at 1600 on the first duty day (that is, after the last pick-up for the day) will not be delivered until the third duty day at 1100 hours. On the basis of this schematic, a simple model can be constructed for the on-base service time of intra-base communication.*

$$(1) \quad T = \frac{H}{2R} + H\,\frac{S}{R}$$

where T = service time of intra-base communications in hours of normal duty time.

H = the hours in a normal duty day.

R = the number of runs per normal duty day. The model assumes that mail stops and action offices are serviced by the same number of runs per duty day.

S = number of sorting levels, i.e., the number of times an item must be sorted to travel from the distribution center to the action office. The first sorting level is the distribution center. Since intra-base communication must travel to and from the base distribution center, it is sorted (2S-1) times between the original pick-up and the final delivery.

*Throughout the subsequent discussion intra-base communication refers to communication between action offices serviced by different mail stops and no pick-up and delivery between mail stops on the same run.

The term $\frac{H}{2R}$ in (1) represents the average waiting time of a piece of communication in the "out" basket until it is picked up, which is half the time between the subsequent runs. The term $H\frac{S}{R}$ represents the time the item spends in the base distribution system.

The model cannot be used to estimate separately the times required for communications to reach the base distribution center and to travel from there to the addressee. To make these separate estimates requires estimates of the various sorting times and the position of the mail stops and action offices on the distribution runs.

While the model was developed to represent the service time for on-base communication, it can also be used for the handling of inter-base mail and routine messages. Here T is the time the item spends in the base distribution system of the forwarding and receiving base, if both bases have identical organizational structures and service frequencies in their base distribution systems. It should be noted that for inter-base mail and messages T does not include any time for "preparation for transmission," thus it does not include the time required by base distribution for sorting outgoing mail and delivering it to the Post Office, or, the time required for logging and transmitting messages from base distribution center to the communications center and message preparation (logging and tape cutting) at the communications center.

For calculation purposes (1) can be restated as:

$$(2) \qquad T = \frac{H}{2}\left(\frac{2S + 1}{R}\right).$$

On the basis of (2), values for T were calculated for varies R's and T's. The results of these calculations are presented in Table II in tabular form and in Figure 8 as graphs. Throughout all calculations, the normal duty day was kept constant at eight hours (H = 8).

These calculations show that base distribution service can be improved by either increasing the number of runs or decreasing the number of sorting levels. Unfortunately, neither of these factors is used to evaluate base distribution. In the official production records and reports, the emphasis is on transportation efficiency. Thus, if a mail stop receives rather little mail, emphasis is placed on combining mail stops, which tends to increase the number of sorting levels required to reach the affected action office, or, on decreasing the number of runs on which the affected mail stops are served, which in turn may increase the special messenger runs which the affected offices have to make.

Table II

Service Times for Intra-Base Communications

Number of Runs Per Duty Day	Number of Sorting Levels				
	1	2	3	4	5
1	12	20	28	36	44
2	6	10	14	18	22
3	4	6.7	9.3	12	14.7
4	3	5	7	9	11
5	2.4	4	5.6	7.2	8.8

All times are in Normal Duty Hours

$$T = \frac{H}{2}\left(\frac{2S + 1}{R}\right)$$

where H = 8 hours

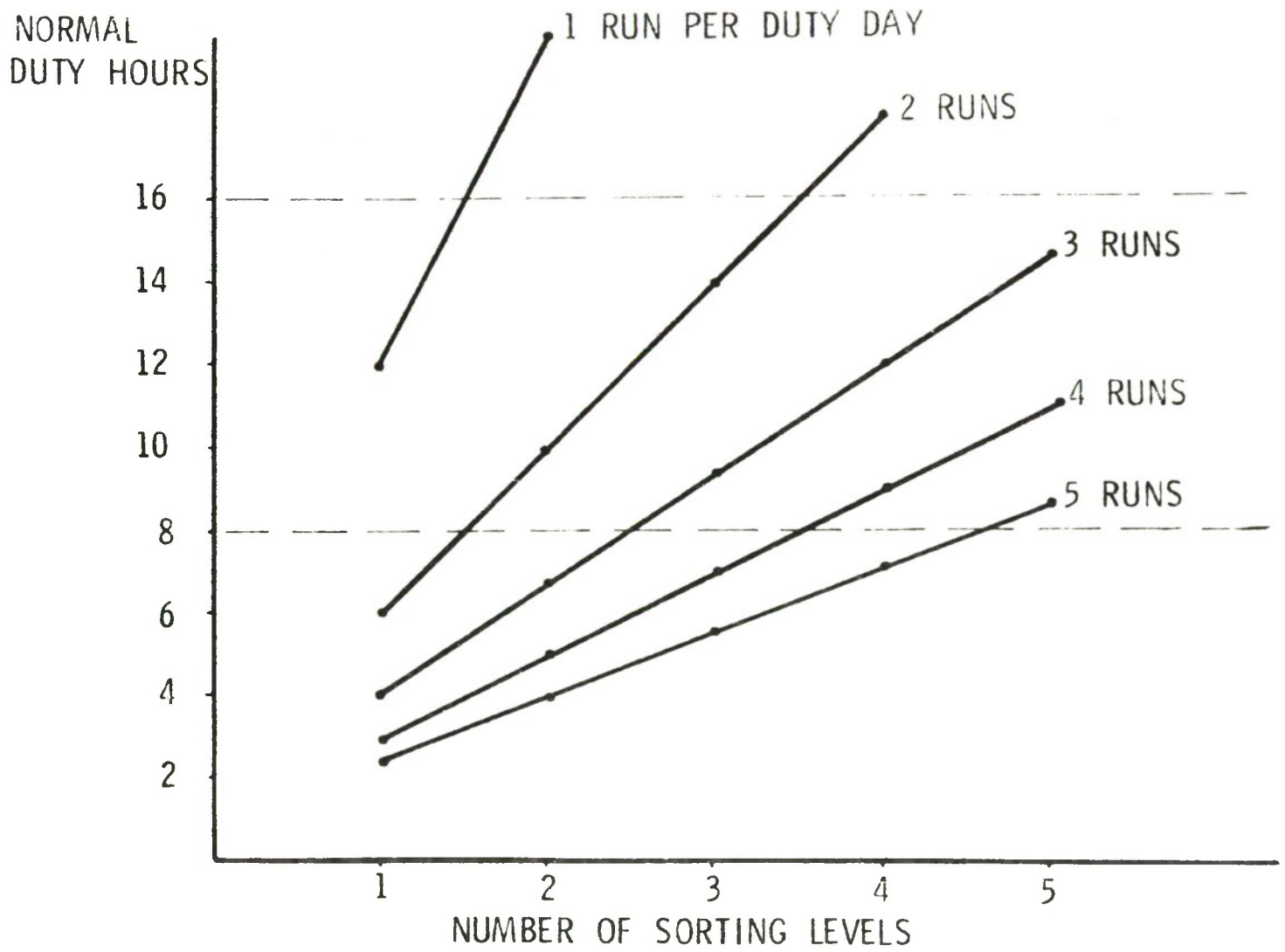


Figure 8. Service Times for Intra-Base Communications

SECTION V

SOLUTIONS

Two general solutions to the base distribution problem readily come to mind. These solutions are a) the installation of Automatic Base Communication Systems (ABCS) as defined in AFCS ROC No.: AFCS-3-66, b) the installation of an Automated Mail and Message Sorting System (AMMSS). The cost-effective solution to the base distribution problem is expected to require a carefully designed combination of these two general types of systems, and a judicious supplementation by special messenger service.

AUTOMATIC BASE COMMUNICATION SYSTEMS (ABCS)

According to AFCS, "The Automatic Base Communication System (ABCS) will interface with the AUTODIN terminal on the base and will automatically route message traffic, both teletype and data, to and from strategically located access terminals on base. The system will be capable of routing to base computers, tape stations, keypunch machines or hard copy printers. The system will automatically perform message accounting functions, routing functions, security checks and speed, code, and format conversion, as required." As AFCS notes, "This system will route and process formatted data and narrative message traffic to and from major on-base customers. It will provide customers more reliable communications needed to support the increased communications demands brought about by automation and increased support. Present trends indicate that future requirements will dictate a writer to reader lapse time of a matter of minutes. This will not be possible without the automation of messages and data distribution in the terminal area."

ABCS, as proposed by AFCS, is admirably suited for handling the high precedent traffic requirements for major sources and sinks of this traffic. It is probably the only type of system which can meet this requirement. However, if the access terminals to this system are not <u>at</u> the source and sink of this traffic, but are "strategically located access terminals on base," then a manual hard copy distribution system is required between these terminals and the actual sources and sinks of the data. This will have to be either a special distribution system, or the distribution system that presently handles mail and message distribution for the area to which a given terminal supplies access. The latter is probably most commonly a two-to-three-sorting-level distribution system. Thus, the advantage gained from multiple user ABCS access terminals is equal to reducing for electric message the present base distribution system by one sorting level. See Figure 8. Greater improvements can be achieved if in addition to installing ABCS a special runner system is instituted which distributes on an as-needed-basis incoming messages from the multiple user access terminals to the individual action offices, and picks up outgoing messages on the same basis.

Electric narrative and data message traffic represent only a small portion of the total traffic handled by base distribution, according to the best data presently available, about one percent of the total traffic. Even if allowance is made for considerable growth in this traffic (far more than AFCS projects), the share of this traffic will hardly reach the 10% level. Thus, an ABCS by itself cannot be considered a solution to the deficiencies of today's base distribution problem.

AUTOMATED MAIL AND MESSAGE SORTING SYSTEMS (AMMSS)

As the simple analysis model showed (in Section IV) the slowness of mail and message distribution on a base is to a large extent due to the fact that all pieces are repeatedly sorted and forwarded. Usually three or more sorts are required to deliver an item from base distribution to an action office. This repeated handling and sorting can be eliminated if all items are sorted centrally and from there delivered directly to the action office. The total man-hour effort required for these deliveries will be about the same as presently, i.e., if all the man-hours spent on mail delivery are considered. However, central sorting can be performed quickly and efficiently only if Automated Mail and Message Sorting Systems (AMMSS) are introduced. If such systems are introduced, an additional benefit should be the reduction in man-hours required for on-base sorting.

If the sorting levels in base distribution are not reduced, then improvements in base distribution are limited to an increase in the frequency of the distribution runs. While this increase would not require automated equipments, it would require a proportional increase in manpower and distribution trucks.

The U. S. Postal System is slowly introducing automated and mechanized sorting equipment. However, the introduction of automated sorting equipments is greatly hampered by the fact that the Postal System cannot prescribe envelope formats and address labeling to its customers -- the public. The Air Force can prescribe both envelope sizes and address labeling to all Air Force to Air Force communications and outgoing mail to non-Air Force addressees, and these communications constitute well over 95% of all the items handled by base distribution. This standardization capability gives the Air Force the potentiality to handle automatically the sorting of all intra-base communications, outgoing mail and messages, and incoming mail and messages from Air Force senders.

It is today within the state of the art to design hand printed address labels which can be read by optical characters recognition devices. This solution will require Air Force-wide standardization of the office symbols preferably on numerals and those letters of the alphabet which are easily distinguishable by optical scanners. It is reasonable to expect that a system can be devised which would identify uniquely each action office within the Air Force by 12 symbols or less including the ZIP code. The scanner would have to read only very little data while the message envelope passes through the scanners. This means that rather slow line scanners are all that is needed for the automated sorters.

Centralized mail sorting creates a number of problems in material handling. These problems are, in general, identical to those of the Post Office and similar solutions should be applicable.

The primary function of the automated mail and message sorting system is the handling of the bulk of the traffic, i.e., is the unclassified routine traffic, however, a number of expansions of the system are technically possible:

(a) Pre-sorting of the Outgoing Mail. While the prime function of AMMSS will be sorting of incoming mail, there is no reason why the same equipment cannot be used for sorting outgoing mail. Since this sort can be very fine, the sort can materially expedite the Post Office's "working" of the official Air Force mail, thus speed the flow of mail between bases as well as on base.

(b) Handling of Classified Messages (through SECRET) and Accountable Mail. The handling would consist of automatically logging the item, receipting the item, preparing receipts for transmission, posting signed receipts, and sorting the item for transmission. This capability is probably cost effective only at bases handling large volumes of classified mail and messages as major command headquarters and system command units.

(c) Since the AMMSS gives the distribution center a computer and optical scanner, it might be feasible to utilize these capabilities for partially automating the redirecting of personal mail by the base locator service. The cost effectiveness of this capability is probably restricted to large bases which have a high turnover rate as, for instance, Lackland AFB which employs eight full-time clerks to handle during normal duty hours the base locator service and the redirecting of personal mail.

SECTION VI

HARMONIZATION

The implementation of an effective on AMMSS requires Air Force-wide standardization of office symbols. Many different efforts are presently in process all aimed at standardizing office designations. The cost of AMMSS will be in part a function of the standard designators which are ultimately adopted; careful coordination with these standardization efforts is therefore mandatory.

SECTION VII

QUANTITIES INVOLVED

Initially, one to three prototype AMMSS facilities should be developed, installed and tested at Air Force bases. The number of Air Force installations at which production AMMSS should be installed will depend on the cost of AMMSS compared to centralized manual sorting and more frequent distribution runs.

World-wide, anywhere between 50 and 100 Air Force installations appear to be candidates for the installation of an AMMSS.

SECTION VIII

CONCLUSIONS AND RECOMMENDATIONS

Improvements in the official base distribution system -- at reasonable cost -- can lead to overall savings by decreasing the total amount of manpower and equipment involved in base distribution and by expediting the flow of messages and mail thus in effect decreasing the unproductive waiting times occuring in Air Force operations due to delays in the flow of paperwork.

To achieve improvements in base distribution, a systems approach to the problem is required. As a first step in such an approach it is recommended that a Category C - Mission Analysis be performed. This Mission Analysis should investigate the entire process of communication flow from the signing (releasing) of the communication until receipt by the addressee's action office, excepting only the inter-base flow of messages and mail, but including any on base preparation of mail and messages for the inter-base flow. The objective of the analysis should be the identification of new system concepts and equipments that will alleviate the deficiencies of the present base distribution system.

The Mission Analysis should answer questions concerning the value and cost of base distribution, the technical feasibility of possible improvements, and the cost/effectiveness of proposed improvements. The analysis should include, but not necessarily be limited to, an investigation of the following topics:

(a) An Air Force-Wide Survey of the Present Base Distribution Systems. This survey should yield the baseline (present) system configuration against which all possible improvements can be measured. The survey should describe the present formal and informal distribution system in terms of the traffic it is required to carry, its configuration, and the resources devoted to it. The survey should include:

1. Estimates of traffic by the following categories.

(a) Incoming and outgoing messages by precedent both narrative and cards, classification, length, source and sink.

(b) Incoming and outgoing mail by non-accountable, registered and certified mail, postage and fee paid mail (intra-Air Force and others), pouch mail, stamped mail.

2. Identification of the major sources and sinks of messages, mail and intra-base communications. Care must be exercised to distinguish between mass sources and sinks as payroll, publications,

data processing, and record storage units and the sources and sinks which represent a collection of action offices as Procurement, Comptroller, Base Supply and DSC/Operations.

3. Survey of all mail and message distribution facilities on a base. This survey should include every office and section involved in receiving and dispatching mail and messages for other offices and sections. The survey should answer such questions as:

(a) Number of traffic breakouts made, number and schedule of runs to pick up incoming traffic and deliver outgoing traffic, number of runs and scheduled stops to deliver incoming and collect outgoing traffic. Number of unscheduled runs, source and sink of these pick-ups and deliveries.

(b) Mail and message control and accounting functions performed.

(c) Traffic handled by facility in terms of categories listed in 1 above.

(d) Number and type of personnel authorized. Amount of time of each authorized slot devoted to mail and message handling.

(e) Vehicles and other equipment authorized to handle or expedite messages and mail.

4. Survey of motor pool services devoted to mail and message distribution. This survey should include the vehicles and driver permanently assigned to the mail and message distribution function as well as taxi service devoted to mail and message distribution.

(b) Procedural Analysis of Base Distribution. This analysis should establish the procedures and restrictions under which any proposed base distribution system must operate. The analysis should be based on a description and justification of the various operations which are performed in mailrooms, base mail and message distribution centers, base communication centers. Particular attention should be focused on such factors as:

1. Message Distribution Center/Communication Center Interface.

2. Mail Distribution Center/Post Office Interface.

3. Message Control Requirements and Procedures.

4. Mail Pouching Procedures, especially processing of mail and messages in envelopes or loose. For instance, does the Air Force over-economize on envelopes at the expense of message and mail sorting and handling times.

5. Handling of classified correspondence.

(c) An Analysis Model of Base Distribution. By means of this model, one should be able to determine the effects on traffic flow due to proposed changes in the configuration and procedures of base distribution. The model should be able to describe the present base distribution systems of various Air Force bases, configuration changes in their distribution systems, and the effect on traffic flow due to shifts in traffic, frequency of service, number of routes, length of routes, number of sorting points, length of sorting and handling times, etc.

(d) A Study of Applicable Mail and Message Sorting Equipments and Techniques. This study should determine the technical feasibility and cost of various techniques and equipments for centralized sorting and direct dispatching of mail and messages to action offices. The study should include a description of the techniques and equipments available and the limitations or requirements which these techniques or equipments place upon base distribution. It is expected that the study will include the investigation of a system that utilizes one line hand printed address codes which can be read by optical scanners that are attached to automatic sorters.

(e) Required Air Force Office Symbols for Automatic Sorting Systems. The study should formulate recommendations for Air Force office symbol designations which are:

1. easily affixed to envelopes without the use of equipments not readily available,

2. readable by unsophistical optical scanners,

3. simply addable to narrative and card messages for on-base routing of these messages.

This study should include a survey of present Air Force office symbol designation, the office symbols being developed for data processing and other office identification schemes presently under consideration.

(f) A Study of Base Distribution Costs. This study should determine the costs of the present base distribution system (baseline costs). In addition, the study should estimate the cost of improvements through increasing the frequency of distribution runs, through centralizing all sorting by means of automated mail and message sorting systems, through automatic distribution of electric communications by means of an Automatic Base Communication System (AFCS ROC-3-66); and through such other improvements suggested during the Mission Analysis.

(g) Development of A Base Distribution System Concept. On the basis of studies (a) through (f) and other pertinent studies, a Base Distribution System Concept should be developed and the technical feasibility and cost effectiveness of the concept should be shown.

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13. ABSTRACT

This report outlines the deficiencies of the present message and mail distribution systems at Air Force bases and proposes a required operational capability for these systems. The preliminary determination of the deficiency and the required operational capability includes a description of the present systems, traffic data from nine Air Force bases, an analysis of special messenger service and a simple base distribution model. Solutions mentioned to achieve the required operational capability are Automatic Message and Mail Sorting Systems (AMMSS) in addition to AFCS's Automatic Base Communication Systems (ABCS). A Category C - Mission Analysis is recommended as a first step to achieve the suggested operational capability. The report follows the outline of a "Required Operational Capability ROC" (AFR 57-1).

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